

U. S. DEPARTMENT OF COMMERCE

JESSE H. JONES, Secretary

NATIONAL BUREAU OF STANDARDS

LYMAN J. BRIGGS, Director

**AUTOMATIC MECHANICAL-DRAFT OIL BURNERS
DESIGNED FOR DOMESTIC INSTALLATIONS**

National Bureau of Standards

(SECOND EDITION)

JUN 19 1942

COMMERCIAL STANDARD CS75-42

Supersedes CS75-39

Effective Date for New Production, From July 20, 1942



**A RECORDED VOLUNTARY STANDARD
OF THE TRADE**

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P R O M U L G A T I O N

of

COMMERCIAL STANDARD CS75-42

for

AUTOMATIC MECHANICAL-DRAFT OIL BURNERS
DESIGNED FOR DOMESTIC INSTALLATIONS

(Second Edition)

On April 27, 1939, at the instance of the Oil Burner Industry Standards Committee, a general conference of representative manufacturers, distributors, and users adopted a recommended commercial standard for automatic mechanical-draft oil burners, which was subsequently accepted in writing by the trade and published as Commercial Standard CS75-39.

On November 21, 1941, with the approval of the standing committee, a revision of CS75-39, drafted by the OBI Standards Committee, was circulated for acceptance. Those concerned have since accepted and approved for promulgation by the United States Department of Commerce, through the National Bureau of Standards, the revised standard as shown herein.

The standard is effective for new production from July 20, 1942.

Promulgation recommended.

I. J. Fairchild,
Chief, Division of Trade Standards.

Promulgated.

Lyman J. Briggs,
Director, National Bureau of Standards.

Promulgation approved.

Jesse H. Jones,
Secretary of Commerce.

AUTOMATIC MECHANICAL-DRAFT OIL BURNERS DESIGNED FOR DOMESTIC INSTALLATIONS

Second Edition

COMMERCIAL STANDARD CS75-42

PURPOSE

1. The purpose of this commercial standard is to establish minimum standard specifications and methods of test for automatic mechanical draft oil burners for the guidance of manufacturers, distributors, installing contractors, and users.

SCOPE

2. This standard covers:

- (a) General requirements.
- (b) Manufacturing and production tests.
- (c) Laboratory requirements and test procedure.
- (d) Installation requirements and performance tests.
- (e) Oil burner certificate placed with each burner installation.

DEFINITIONS

3a. *Automatic oil burner*.—A burner provided with an automatic device or devices which control the temperature of the heating medium either directly or indirectly.

3b. *Mechanical-draft oil burner*.—An oil burner through which air for combustion is supplied by a power-driven fan shall, for the purposes of this standard, constitute a mechanical-draft oil burner.

3c. *Primary control*.—An automatic device to prevent the abnormal discharge of oil in the event of ignition failure or premature flame extinguishment.

3d. *Pull-through type*.—Oil-burning equipment which employs a power-operated exhaust fan to draw the products of combustion from the combustion chamber and discharge them into the flue-gas outlet.

3e. *Manufacturer*.—For the purposes of this standard, the manufacturer shall be the company or organization which evidences its responsibility to the purchaser by:

- (1) Permanently affixing its name, address, and nationally registered trade-mark or trade name to the burner,
- (2) Permanently affixing its nationally registered trade-mark or trade name to the outside of the cover of the primary control if supplied as a separate part, in the event it does

- not already bear the nationally registered trade-mark or trade name of the control manufacturer,
- (3) Printing its name, address, and nationally registered trade-mark or trade name on the certificate,
 - (4) Printing its name, address, and nationally registered trade-mark or trade name on the instruction manual, and
 - (5) By having its name and address listed in the Underwriters' List of Inspected Appliances.

GENERAL REQUIREMENTS

BURNER CONSTRUCTION

4a. *Long-hour motor.*—Oil-burner-motor service may be assumed to be equivalent to continuous operation, and the motor shall be of ample capacity and be designed for long-hour duty, and be so designated (motor name plate shall bear the words "Long-Hour Duty") by the motor manufacturer.

4b. *Definition.*—A long-hour-duty motor shall conform to NEMA specifications for long-hour-duty motors. (See specifications attached, p. 10.)

4c. *Motor load.*—The motor shall be of long-hour specification, and its name-plate rating shall equal or exceed the load occurring when the burner is operated with air adjustment full open with maximum size fan and oil pressure at maximum recommended by the manufacturer in his installation manual. Motors capable of continuous operation at loads in excess of name-plate rating and within NEMA requirements for long-hour service shall be considered as meeting the above requirement when provided with suitable *overtemperature* protection.

5. *Radio interference.*—The burner shall cause no unreasonable amount of radio interference.

6. *Quietness.*—The burner shall be reasonably free from disturbing combustion or mechanical sound.

BURNER PERFORMANCE RATINGS

7. *CO₂ rating.*—The burner shall be capable of producing and maintaining the CO₂ in the flue gas at not less than 10 percent without visible smoke at all oil rates within the manufacturer's rated capacity.

8. *Smoke determination.*—After combustion has reached equilibrium, the amount of smoke in the flue gases, when viewed lengthwise through 4 feet of the smoke pipe in accordance with the Underwriters' Laboratories, Inc. Standard for Domestic Oil Burners (Subject 296) March 1934 and subsequent revisions, shall not reduce the output of a standard photoelectric cell from 9 microamperes with a clear smoke pipe to less than 8 microamperes.

BURNER SAFETY

9a. *Safety standard.*—The burner shall meet the safety standards of Underwriters' Laboratories, Inc., Standard for Domestic Oil Burners (Subject 296), March 1934 and subsequent revisions.

9b. *Test procedure.*—In accordance with above. (Presence on the burner of label of Underwriters' Laboratories, Inc., shall be accepted as evidence of compliance with this safety requirement.)

BURNER GUARANTEES

10. *Guarantee.*—Burner and burner controls shipped with the burner shall be guaranteed by the burner manufacturer against defects of material and workmanship for a period of 1 year from date of installation.

11. *Manuals.*—A printed comprehensive service and installation manual shall be prepared and one or more copies shall be submitted by the burner manufacturer to the authorized laboratory for approval. The manufacturer shall furnish one or more copies of his service and installation manual to each of his authorized dealers.

12. *Tests.*—Burner tests for certification shall be conducted according to test procedures established by this standard and approved by the oil-burner industry.

MANUFACTURING AND PRODUCTION TESTS

13. The following standards apply to manufacturing and production tests on automatic mechanical-draft oil burners:

PRODUCTION TESTS ON PRESSURE OIL BURNERS

14. Each burner shall be manufactured and tested according to the following procedure:

14a. Burners shall be manufactured so that—

- (1) Proper alinement between motor and pump shaft is assured.
- (2) All parts are interchangeable with like parts on like models.
- (3) Where flexible couplings are used between motor shaft and pump shaft the misalignment (axial displacement) shall not exceed 0.005 inch per inch of distance between the two shaft ends and the axes of the two shafts shall be parallel within 1° (angular alinement).
- (4) The motor and pump shall be securely mounted in such manner that the alinement of these two units shall remain permanent within the tolerances specified above.
- (5) The motor load shall not exceed its rated capacity.
- (6) The ignition points of electrodes shall be made of heat-resisting material and securely fastened to avoid change of location.

14b. Each assembled burner shall be bench-tested and adjusted for suitable period of time:

- (1) To reveal and eliminate—
 - A. Oil leaks.
 - B. Electrical defects.
 - C. Mechanical noise and vibration.
 - D. Other defects.
- (2) To determine—
 - A. Pressure regulating valve adjustment.
 - B. Total motor load.
 - C. Proper functioning of ignition means (with or without actual fire test).

14c. Each burner shall be tested at the maximum rated oil pressure recommended by the manufacturer in his installation manual, but in

no case at less than 100 pounds per square inch for high-pressure atomization burners; for low-pressure and horizontal rotary domestic burners the burner shall be tested at the maximum pressure recommended in the manufacturer's installation manual.

14d. At the conclusion of the operating tests of each burner the air gap between electrodes and the relation of electrodes to nozzle shall be inspected for acceptance and shall be in accordance with the specifications contained in the manufacturer's manual for that particular model.

PRODUCTION TESTS ON WALL FLAME AND ATOMIZING VERTICAL ROTARY BURNERS

15. Each burner shall be manufactured and tested according to the following procedure:

- (1) The tolerances of all parts shall be established and checked with suitable gages or fixtures so that they can be assembled without altering the parts.
- (2) Motor shall operate as an assembly (motor and driven parts) and be checked for:
 - A. Quite operation.
 - B. Shaft alinement.
- (3) Oil-distributing device shall be inspected for:
 - A. Tube angle.
 - B. Tube concentricity.
- (4) Fan shall be inspected for balance and run out.
- (5) Igniters shall be inspected for:
 - A. Spark gap.
 - B. Insulation.
- (6) Oil valve in its manufacture shall be tested for leakage.
- (7) Igniter lead wire shall conform to Underwriters' specifications in all respects.

LABORATORY REQUIREMENTS AND TEST PROCEDURE

16. The following standards apply to laboratory requirements and test procedure for automatic mechanical draft oil burners.

LABORATORY FACILITIES AND EQUIPMENT

17. The equipment and facilities required by the laboratory for conducting the above tests as outlined shall include the following:

- (1) Space for not less than six heating boilers varying in size, suitable for oil burners of capacities up to and including 8 gal/hr.
- (2) At least three boilers covering the above range at the beginning of operations.
- (3) A separate chimney or its equivalent for each boiler.
- (4) Qualified mechanics for constructing refractory combustion chambers in accordance with drawings and specifications as submitted, and qualified mechanics for doing the necessary pipe work and mechanical assembly and adjustment in connection with the installation of burner.
- (5) Approved sound-level meters and microphones.

- (6) Approved radio-noise meters and accessories.
- (7) Light-sensitive equipment for determining smoke.
- (8) Approved flue-gas analysis equipment.
- (9) Oil-rate flow meters or equivalent means for determining oil rates of burners in operation.
- (10) Oil storage facilities.
- (11) Accurate electric ammeters, voltmeters, and wattmeters.
- (12) Accurate suitable draft gages.

BURNER CONSTRUCTION—MOTOR

18. The oil-burner unit as submitted for approval shall be equipped with a long-hour duty motor and tests shall be run at the maximum load conditions that this particular burner model may be adjusted to. The results of these tests shall indicate that the maximum motor loading is in accordance with NEMA requirements for a long-hour duty motor.

MECHANICAL CONSTRUCTION

19. The burner is to be inspected and checked for the following:

- (1) Proper alinement between motor and pump.
- (2) Interchangeability of all like parts on like models.
- (3) Reasonable freedom from vibration and undue wear.
- (4) Motor and pump are securely mounted in such manner that the alinement of these two units shall remain permanent within the specified tolerances.
- (5) That the motor cannot be loaded in excess of its rated capacity under normal operating conditions.
- (6) Ignition points of electrodes which shall be made of heat resistant material and securely fastened to avoid change of location.

SAFETY STANDARDS

20. No burner shall be accepted at the authorized laboratory for inspection and test unless it complies with the requirements of paragraphs 9a and 9b.

DRAWINGS

21. A complete set of detail manufacturing blueprints and/or photographs to be the same as required by the Underwriters' Laboratories, Inc., shall accompany each model and shall remain in the confidential custody of the laboratory.

INSTALLATION AND SERVICE MANUAL

22. Each burner model submitted to the laboratory for test shall be accompanied by a printed comprehensive installation and service manual, and the laboratory shall review this manual and use the instructions therein contained for installing and testing the unit as submitted. The manual shall contain:

- (1) Cross-sectional views of each model to disclose method of adjustments and replacement of parts.
- (2) Combustion-chamber dimensions and construction.
- (3) Oil-tank and piping diagrams and instructions.
- (4) Electrical diagrams and instructions.
- (5) Draft specifications and chimney information.

- (6) Diagrams and instructions for installation adjustment and operation:
 - (1) Electric controls and limits.
 - (2) Combustion.
- (7) Air requirements into the furnace room for satisfactory combustion.

LABORATORY TESTS

23. Following the mechanical inspection outlined above, the burner shall be installed in a suitable boiler exactly in accordance with the installation instructions contained in the manufacturer's manual. After the burner is installed and during the entire period of its operating test, the entire boiler or furnace structure shall be maintained tight against air leakage so that infiltration of air into the combustion space or boiler passages cannot affect the flue-gas analysis readings at the boiler or furnace flue outlet.

COMBUSTION PERFORMANCE

24. A burner submitted for test shall be operated on the heaviest grade of fuel for which it is approved by the Underwriters' Laboratories, and each model submitted shall be tested at its minimum and maximum firing rates, as indicated by the manufacturer and at intermediate rates in steps of 1 gal/hr in the case of models that are rated over a range exceeding 1 gal/hr difference between the minimum and maximum rate.

25. *Smoke determination.*—After combustion has reached equilibrium, the amount of smoke in the flue gases, when viewed lengthwise through 4 feet of the smoke pipe in accordance with the Underwriters' Laboratories, Inc., Standard for Domestic Oil Burners (Subject 296) March 1934 and subsequent revisions, shall not reduce the output of a standard photoelectric cell from 9 microamperes, with a clear smoke pipe, to less than 8 microamperes.

26a. *Test procedure.*—The test procedure shall begin with the manufacturer's minimum rating and continue in steps of not more than 1 gal/hr to the manufacturer's maximum rating. The flue gas sample for analysis shall be taken at the boiler or furnace flue gas outlet. Except for pull-through types, the draft value in the combustion chamber for this test shall be in accordance with the manufacturer's specifications but in no case shall it exceed 0.03 inch of water for burners tested at 5 gal/hr or less, and shall not exceed 0.05 inch of water for burners tested at more than 5 gal/hr. This same draft value shall be used in determining the maximum burning rate.

26b. In determining maximum burning rates for full mechanical draft burners, all air for combustion shall be supplied by the burner fan or blower. Where maximum burning rates are designated by manufacturer, with partial mechanical draft, such maximum burning rates shall be qualified in terms of minimum draft and port area in manufacturer's manuals, rating, and instruction sheets. Where burners are *designed* for partial mechanical draft the maximum burning rates shall be qualified in terms of minimum draft and port area in manufacturer's manuals, rating, and instruction sheets.

RADIO INTERFERENCE

27. The burner shall cause no unreasonable amount of radio interference. A suitable approved form of radio-interference noise meter shall be connected to the same power supply as that operating the burner, located within the same room with the burner and the burner shall be operated through a series of normal operating cycles while readings are taken on the radio-noise meter. A signal exceeding ----- intensity shall indicate excessive interference. This value is to be recommended by the oil burner industry standards committee as a result of accumulated experience over a length of time considered suitable by the committee for establishment of the standard and approved by the industry.

NOISE

28a. A burner shall be reasonably free from disturbing combustion and mechanical sounds.

TESTS

28b. Suitable noise-proof enclosures are to be provided for the burner and its boiler when under test, and noise readings are to be taken in accordance with American Standards Association procedure as applying to domestic equipment. The standard of permissible sound level shall be determined by the testing laboratory as the result of accumulated experience, subject to the approval of the oil burner industry through its standards committee.

Sound-level readings are to be taken of the burner:

- (1) Operating without flame.
- (2) Operating with flame and at minimum and maximum burning rates.

INSTALLATION REQUIREMENTS AND PERFORMANCE
TESTS

INSTALLATION REQUIREMENTS

29. *Size.*—The burner shall be of adequate size for the boiler or furnace and the connected heating load as recorded on the oil burner certificate by the installer.

30. *Certificate.*—Following installation of the burner certain test data shall be obtained and recorded by the installer on the oil burner certificate to be placed with each oil burner installation. The test shall cover the following points: CO₂ in the flue gas by analysis, draft, stack temperature, firing rate, and smoke. The oil-burner certificate shall be printed (not mimeographed) in a minimum size of 8½ by 11 inches, with all the printing on one side, and shall be posted and protected by transparent material.

31. *Requirements.*—The standard requirements as approved by the industry are as follows:

- (1) CO₂.—The CO₂ in the flue gas by analysis shall be not less than 8 percent.

- (2) *Draft*.—The draft shall be in accordance with specifications in the manufacturer's installation manual. An automatic draft regulator or its equivalent is required.
- (3) *Stack temperature*.—The stack temperature shall be measured on the boiler side of automatic draft regulator and not more than 12 inches from the boiler smoke connection. The stack temperature shall be measured at the certified firing rate. If an automatic draft regulator is built into the boiler or furnace such regulator shall be closed when the stack temperature is measured.
- (4) *Firing rate*.—The firing rate shall be based on the burner manufacturer's recommendation for the existing total connected load. Burner shall be fired at that rate as a minimum, but not to exceed 25 percent additional for the maximum rate. The firing rate at which the burner is set shall be within the firing range for which the burner has been approved by the laboratory, and not more than the firing rate designated on the boiler, furnace, or unit, or designated by the manufacturer of the boiler, furnace, or unit.
- (5) *Smoke*.—During the above test, there shall be no visible smoke at the chimney.
- (6) *Installation Manual*.—The burner shall be installed in accordance with manufacturer's installation manual.

INSTALLATION TEST PROCEDURE

32. *Equipment*.—The following equipment shall be available on each oil burner installation before the tests are started:

32a. Where the oil rate is not indicated on the nozzle tip, a suitable device for determining the rate in terms of gallons per hour fed to the burner shall be used. This may be in the form of a graduated glass vessel.

32b. A suitable flue-gas analyzer for determining the percentage of CO₂ in the flue gases.

32c. A suitable draft gage, graduated in hundredths of an inch of water.

32d. A suitable thermometer to indicate the flue-gas temperatures.

32e. Provision for inserting a thermometer into the flue pipe as follows: Not more than 12 inches from the boiler or furnace outlet, measured on the center line of the flue pipe, there shall be a hole not more than ½ inch in diameter, located at the side of the pipe on the center line so that the thermometer may be inserted horizontally. The thermometer is to be placed so that the sensitive element is one-fourth of the pipe diameter from the near side of the flue pipe. The opening around the thermometer stem shall be sealed to prevent air leakage. This same opening may be used for checking draft and sampling flue gases.

NOTE.—Other things being equal, flue-gas temperature may be expected to be higher by some 50° F. if the smoke pipe is insulated. Stack temperature is largely controlled by boiler design. High stack temperatures do not necessarily condemn the burner.

32f. In addition to the above, provision shall be made on the boiler or furnace for inserting a small tube into the combustion chamber for measuring the draft. The area of the opening shall not exceed that of a $\frac{1}{2}$ -inch diameter round hole. ($\frac{1}{4}$ -inch pipe tap).

33. *Test procedure.*—The test procedure is as follows:

33a. The burner shall be operated and the fuel rate adjusted to that required for the particular installation.

33b. The draft then shall be adjusted to meet the burner manufacturer's specifications, both over the fire and at the breeching.

33c. Combustion-air adjustments are to be made to give the highest CO_2 without visible smoke (unburned carbon) at the chimney. If the minimum required percentage of CO_2 cannot be obtained in the breeching, it will be permissible to take CO_2 over the fire, which will be acceptable. In that event, both CO_2 readings shall be recorded on the certificate. A considerable difference between the two CO_2 readings indicates a leak of air into the flue passes or fire box of the boiler.

33d. Stack temperature shall be recorded after 10 minutes of operation after reaching steaming temperature for steam boilers, or 180° F. water temperature for hot-water boilers, or 125° F. bonnet temperature for hot-air heating plants.

34. *Readings.*—During the period of operation to permit flue-gas temperatures to reach maximum, periodic readings of draft, CO_2 , and oil rate shall be taken and the average recorded on the certificate. All controls and limiting devices shall be checked for proper operation.

OIL-BURNER CERTIFICATE

AS REQUIRED BY COMMERCIAL STANDARD CS75-42

(Name of manufacturer) (Address)
Manufacturer of _____ oil burner guarantees model _____, serial No. _____

The company warrants all equipment manufactured by it and bearing its name plate to be free from defects in workmanship or material under normal use and service. If any part of the equipment herein described, and sold by the company proves to be defective in workmanship or material, and if such part is within 12 months from date of shipment from the company's factory returned to such factory, transportation charges prepaid, and if the same is found by the company to be defective in workmanship or material, it will be replaced or repaired, free of charge, f. o. b. factory. The company assumes no liability for consequential damages of any kind and the purchaser by acceptance of this equipment will assume all liability for the consequences of its use or misuse by the purchaser, his employees, or others. A defect in the meaning of this warranty in any part of said equipment shall not, when such part is capable of being renewed, repaired, or replaced, operate to condemn such equipment. This warranty is expressly in lieu of all other warranties, guarantees, obligations, or liabilities, expressed or implied by the company or its representatives.¹

This burner bears the seal of the official inspection agency of the oil burner industry evidencing compliance with Commercial Standard CS75-42 as issued by the National Bureau of Standards of the United States Department of Commerce.

This burner is approved for use with fuel oil not heavier than commercial standard grade No. _____

The oil burner installed in Boiler { Name _____
No. _____
Furnace { Name _____
No. _____

with _____ square feet of standing
steam _____ radiation plus _____
hot water _____
square feet of additional connected load; or
with _____ square inches cross-sectional area of warm air supply
pipes measured at the furnace take off.

Other special data: _____
at _____ and has been installed by
_____ (Address)

_____ (Name of installer and address)
in accordance with specifications in oil burner manufacturer's instruction manual.

This installation has been installed to comply with all local regulations, codes, and ordinances and required permits have been secured; and has been tested in accordance with test procedure of Commercial Standard CS75-42 and readings taken as follows:

CO₂ { Over fire _____ stack temperature at breeching _____ ° F.
At breeching _____
Draft { Over fire _____ inches H₂O. Firing rate _____ gal/hr.
At breeching _____ All controls and limiting devices have
been checked for proper operation

Fuel used CSG No. _____
The above test results are certified to be true.

Date _____ Per _____ (Company)

(Signature)

24-hour service on this oil-burner installation without charge is guaranteed for
a period of 1 year
from _____ by
(Date)

Per _____ (Company)

(Signature)
Telephone _____

¹ The wording of this paragraph may be varied to suit the individual manufacturer.

NEMA SPECIFICATIONS FOR LONG-HOUR SERVICE

Motors used on mechanical-draft oil burners shall comply in every respect with National Electrical Manufacturers Association Motor and Generator Standards (publication 38-49 and superseding issues) for small power motors:

Direct current..... MG8-30 to MG8-70, inclusive, and
Alternating current..... MG8-80 to MG8-127, inclusive

The following extracts taken from NEMA Motor and Generator Standards, publication 38-49, for alternating-current motors are given as an indication of the more pertinent items to be considered in determining whether or not a given motor as applied meets the oil burner industry standards:

PERFORMANCE STANDARDS

MG8-100 TEMPERATURE RISE

The temperature rise of each of the various parts, above the temperature of the cooling medium, shall not exceed the values given in the following table:

Class of insulation.....	O	A
Load, percentage of rated capacity.....	100	100
Time rating.....	Continuous	
Temperature rise:		
1. Coil windings, cores, and mechanical parts in contact with or adjacent to insulation:		
(a) General-purpose motors.....		40° C
(b) Totally enclosed and totally enclosed fan-cooled motors.....		55° C
(c) Motors and generators other than (a) and (b).....	35° C	50° C
2. Commutators and collector rings:		
(a) General-purpose motors.....		55° C
(b) Totally enclosed and totally enclosed fan-cooled motors.....		65° C
(c) Motors and generators other than (a) and (b).....	50° C	65° C

MG8-101 MINIMUM EFFICIENCIES, POWER FACTORS, AND APPARENT EFFICIENCIES ²

The efficiency, power factor, and apparent efficiency of the following ratings shall not be less than the values given below at rated voltage, frequency, and load.

2-, 4-, 6-, and 8-pole, 60-cycle motors, single-phase

(a) Long-hour service

Rating	Efficiency				Power factor				Apparent efficiency			
	Speed (rpm)				Speed (rpm)				Speed (rpm)			
	3, 600	1, 800	1, 200	900	3, 600	1, 800	1, 200	900	3, 600	1, 800	1, 200	900
<i>hp</i>	%	%	%	%	%	%	%	%	%	%	%	%
1/8.....	45	53	45	38	57	52	43	36	28	30	21	15
1/6.....	49	58	49	42	62	56	46	38	34	36	25	18
1/4.....	53	62	53	45	66	60	49	40	39	42	29	20
1/3.....	54	63	54	46	67	61	50	41	41	44	31	22
1/2.....	55	65	55	47	69	63	52	43	44	47	33	23
3/4.....	57	67	57	49	72	65	53	44	46	49	34	24

² The power factor and efficiency must not be less than the values shown and such that their product is not less than the values given for apparent efficiency.

SIGNIFICANCE OF INSTALLATION REQUIREMENTS AND PERFORMANCE TESTS

35. The oil-burner certificate posted after installation is the guarantee or affidavit to the ultimate consumer that the installation complies with these minimum standards. The significance of the various recorded data on this certificate is summarized as follows:

36a. CO_2 (**carbon dioxide**) is one of the products of combustion of fuel oil. Its percentage by volume under prescribed test conditions is an important index of the *quality* of the combustion performance of the burner. High CO_2 with no chimney smoke shows that the burner has been designed, installed, and adjusted so well it needs little excess air to give a clean fire. It will be noted that the manufacturing laboratory standards prescribe a minimum performance of 10 percent of CO_2 , whereas the installation standards permit a minimum of 8 percent of CO_2 . This difference takes into account the effect of variables that are impracticable to control under normal operating conditions to the extent possible under laboratory test procedure and supervision.

36b. Lower CO_2 may or may not be a reflection on the design of the burner itself but may be caused by (1) improper burner air-shutter adjustment, (2) poor atomization of the fuel, (3) improper flame shape, (4) improper size, shape, or material of combustion chamber or combustion hearth, (5) excessive or uncontrolled draft, (6) underfired boiler or furnace, and (7) air leaks in boiler or furnace setting. This latter cause is often due to improper installation of boiler or furnace. These standards provide a definite means of checking this condition by stating that when the minimum CO_2 of 8 percent cannot be obtained in the breeching, it will be permissible to take a CO_2 reading over the fire, in which case both readings must be recorded on the certificate. CO_2 considerably higher over the fire than in the breeching (1 or 2 percent or more) is an indication of a sizeable air leak into the flue gas passages of the boiler or furnace which should be located and sealed. In new boilers the installer of the boiler or furnace is responsible for the location and correction of such air leaks. In any event, the installer of the oil burner should immediately advise the purchaser of this condition when it is encountered, particularly in those cases where it is not corrected.

37. **Draft** intensity depends upon the height of the chimney and the temperature difference between the outside air and the chimney gases. The capacity of the chimney is determined by the draft intensity and the cross-sectional area of the chimney. The function of the chimney and draft is to dispose of the products of combustion from the boiler or furnace. Either too high or too low a draft may adversely affect the performance of the burner and heating plant; therefore, a draft regulator is required by these standards to adjust high or low drafts to acceptable values within reasonable limits, that

is, high enough to dispose of the combustion gases so that smoke or odor nuisance is not created and at the same time, low enough to maintain economical operation. Any feature of design, construction, or use which impairs the proper functions of the chimney is likely to cause combustion difficulties; therefore, any additional openings in a chimney connected to the central heating plant, such as for fireplaces, stoves, heaters, or vents should be eliminated.

38a. **Stack temperature** shows how well a furnace or boiler absorbs the heat released in it by the burning fuel. It is largely controlled by boiler or furnace design, although the burner design, application, or adjustment also may be responsible for increasing stack temperatures above normal. The principal causes of high stack temperature directly related to the burner or burner installation are (1) improper size or shape of combustion chamber, (2) excessive firing rate adjustment, (3) excessive draft, and (4) dirty boiler or furnace flues. Given proper burner application and performance for the connected heating load, and assuming clean heating surfaces in boiler or furnace and proper water conditions where a steam boiler is used, high stack temperatures generally indicate (1) an undersized boiler or furnace, or (2) insufficient or poorly designed heating surface in the boiler or furnace.

38b. To properly evaluate stack temperatures, they must be considered in relation to CO_2 for the purpose of determining the stack loss, or percentage of heat in the fuel burned which goes up the chimney. Figure 1 is a chart showing this relationship. It will be noted that with 8 percent of CO_2 and a stack temperature of 400°F ., the stack loss is approximately 18 percent; with 13 percent of CO_2 the stack temperature can be increased to 600°F without increasing the percentage of stack loss. While excessively high stack temperatures are usually objectionable because of increased stack loss, excessively low stack temperatures due either to poor design or underfiring of boiler or furnace may be equally objectionable in that they may be inadequate for the maintenance of proper draft and, further, the condensation, in the chimney, of water vapor from the combustion gases can be highly destructive to certain materials.

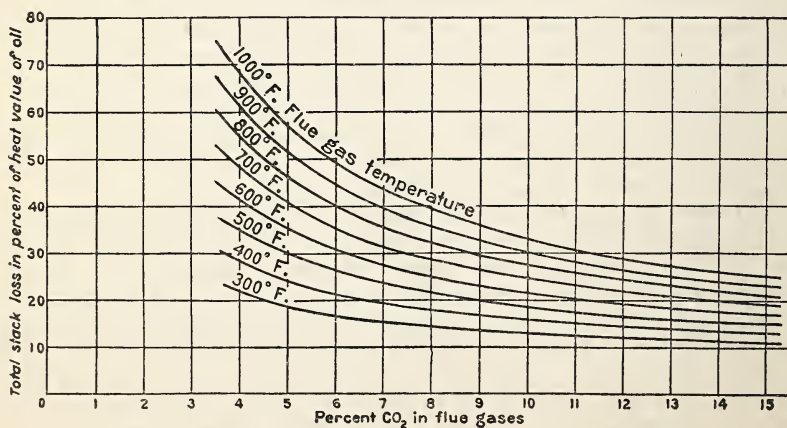


FIGURE 1.—Stack-loss curves for combustion of domestic oil-burner distillates.

(Technical Bulletin 109, U. S. Dept. of Agriculture.)

39. **Firing rate** is important in that it must be adequate in the coldest weather to supply the requirements of the total connected load, which includes installed radiation or its equivalent, allowance for piping loss, reserve for pick-up, and allowance for domestic hot water where supplied by the heating system, and at the same time avoid creating a condition that may cause excessive stack temperatures or uneconomical operation for the reasons discussed above. The 25-percent excess firing rate permitted in the standards should not be used except where required to offset deficiencies in boiler or furnace capacity or deficiencies in installed radiation or equivalent.

40. **Smoke** is unburned carbon in the combustion gases and is evidence of improper burner application or adjustment. Smoke should not be confused with the appearance of condensed water vapor in the products of combustion sometimes visible as a light haze at the top of the chimney.

41. **Controls** are required to be tested as an additional precaution to prove accuracy of electrical work and instrument adjustment before allowing automatic operation of the equipment.

MANUFACTURER'S CERTIFICATE

42. In order that purchasers of oil burners may become familiar with the significance of minimum standard requirements and tests, as a basis for fair competition and improved confidence in oil-burner performance, it is recommended that the following statement be included in manufacturer's warranties, labels, invoices, contracts, sales literature, etc.:

This oil burner is certified by the ----- Company, manufacturer, to comply with the requirements of Commercial Standards CS75-42 as issued by the National Bureau of Standards, of the United States Department of Commerce. It bears the seal of the official inspection agency of the oil-burner industry evidencing compliance therewith.

EFFECTIVE DATE

The standard is effective for new production from July 20, 1942.

STANDING COMMITTEE

The following comprises the membership of the standing committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Each association nominated its own representatives. Comment concerning the standard and suggestions for revision may be addressed to any member of the committee or to the Division of Trade Standards, National Bureau of Standards, which acts as secretary for the committee.

Manufacturers:

R. M. SHERMAN (chairman), Silent Glow Oil Burner Corporation, Hartford, Conn.

EARL NESMITH, Williams Oil-O-Matic Heating Corporation, Bloomington, Ill.

F. H. FAUST, General Electric Co., 5 Lawrence Street, Bloomfield, N. J.

ALLAN F. REIF, Reif-Rexoil, Inc., 37 Carroll Street, Buffalo, N. Y.

T. H. SMOOT, Fluid Heat Division, Anchor Post Fence Co., Eastern Avenue and Kane Street, Baltimore, Md.

RAY G. WHIPPLE, Harvey-Whipple, Inc., Springfield, Mass.

Distributors:

J. C. CAMPBELL, The Elliott-Lewis Co., 2514 North Broad St., Philadelphia, Pa. Representing Electrical Association of Philadelphia.

FREDERICK BECKWITH, 839 Beacon St., Boston, Mass. Representing Massachusetts Oil Heating Association, Inc.

DAYLE G. MALONE, Petroleum Heat & Power Co., 3301 S. California Avenue, Chicago, Ill. Representing Chicago Oil Burner Association, Inc.

A. C. JENKINS, Jenkins Engineering Co., 518 Virginia St., Seattle, Wash. Representing Oil Fuel Dealers Association.

E. P. FAHEY, Ray Oil Burner Co., 629 Grove Street, Jersey City, N. J. Representing Pacific Oil Burner Association.

L. LEROY GRITZAN, Oil Heating Division, Merchants & Manufacturers Association, Inc., 400 Star Building, Washington, D. C.

Users:

CHARLOTTE PAYNE, representing National Council of Women, 501 Madison Avenue, New York, N. Y.

R. K. THULMAN, Federal Housing Administration, Washington, D. C.

L. N. HUNTER, National Radiator Corp., Johnstown, Pa. Representing Institute of Boiler & Radiator Manufacturers.

WILLIAM VAN ALLEN, New York Chapter A. I. A., 141 East 52d St., New York, N. Y. Representing American Institute of Architects.

H. A. ROLNICK, Rolnick Testing & Manufacturing Co., 316 North 22d Street, Philadelphia, Pa.

M. W. MERRILL, United States Metals Refining Co., 400 Middlesex Avenue, Carteret, N. J. Representing National Association of Purchasing Agents.

HISTORY OF PROJECT

Following a series of industry-wide meetings for the development of standards for mechanical draft oil burners, the Oil Burner Industry Standards Committee, under date of February 17, 1939, requested the cooperation of the National Bureau of Standards in the establishment of a commercial standard for mechanical draft oil burners. A preliminary manufacturer-distributor conference was held on March 15, 1939, at the Chamber of Commerce of the United States, Washington, D. C.; which reviewed and revised a proposed draft of the standard.

The proposed commercial standard as revised by the conference of March 15 was then circulated to producers, distributors, installing contractors, and users for comment and criticism, and a general conference of all those directly concerned was held on April 27, 1939, at the Departmental Auditorium, Washington, D. C. This conference revised the draft further and recommended that it be circulated to the trade for written acceptance. Accordingly, the recommended commercial standard was submitted to producers, distributors, and users under date of May 12, 1939, and following written acceptance by a satisfactory majority, announcement was issued on August 18, 1939, that the standard would become effective for new production on November 1, 1939, as recommended by the general conference.

On October 2, 1941, the Oil Burner Industry Standards Committee submitted recommended revisions, which included a number of definitions, requirements for smoke determination, draft limitations during laboratory tests, firing-rate limitations, and additional requirements for the oil-burner certificate. These were approved by the standing committee on November 14, 1941, and were circulated on November 21, 1941, to the industry for written acceptance. Following written acceptance by a satisfactory majority, announcement was issued on March 20, 1942, that the revised standard would become effective for new production on July 20, 1942.

ACCEPTANCE OF COMMERCIAL STANDARD

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this commercial standard.

Date_____

Division of Trade Standards,
National Bureau of Standards,
Washington, D. C.

Gentlemen:

Having considered the statements on the reverse side of this sheet, we accept the Commercial Standard CS75-42 as our standard of practice in the

Production ¹ Distribution ¹ Installation ¹ Use ¹

of automatic mechanical draft oil burners.

We will assist in securing its general recognition and use and will cooperate with the standing committee to effect revisions of the standards when necessary.

Signature of individual officer_____

(In ink)

(Kindly typewrite or print the following lines)

Name and title of above officer_____

Company_____

(Fill in exactly as it should be listed)

Street address_____

City and State_____

¹ Please designate which group you represent by drawing lines through the other three. Please file separate acceptances for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interests, trade papers, colleges, etc., desiring to record their general approval, the words "In principle" should be added after the signature.

TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial standards are commodity specifications voluntarily established by mutual consent of the industry. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions; but, since they represent the will of the industry as a whole, their provisions, through usage, soon become established as trade customs, and are made effective through incorporation into sales contracts by means of labels, invoices, and the like.

2. *The acceptor's responsibility.*—The purpose of commercial standards is to establish for specific commodities, nationally recognized grades or consumer criteria, and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the commercial standard where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function performed by the Department of Commerce in the voluntary establishment of commercial standards on a Nation-wide basis is fourfold: First, to act as an unbiased coordinator to bring all branches of the industry together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptance and adherence to the standard on the part of producers, distributors, and users; and fourth, after acceptance, to publish and promulgate the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement and promulgation.*—When the standard has been endorsed by companies representing a satisfactory majority of production, the success of the project is announced. If, however, in the opinion of the standing committee of the industry or the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

ACCEPTORS

The organization and individuals listed below have accepted this commercial standards as their standard of practice in the production distribution, installation, and use of automatic mechanical-draft oil burners designed for domestic installations. Such endorsement does not signify that they may not find it necessary to deviate from the standard, nor that producers so listed guarantee all of their products in this field to conform with the requirements of this standard. Therefore, specific evidence of conformity should be obtained where required.

ASSOCIATIONS

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|---|--|
| <p>American Association of Engineers, Chicago, Ill.</p> <p>American Home Economics Association, Washington, D. C. (In principle).</p> <p>American Hospital Association, Committee on Simplification and Standardization, Philadelphia, Pa.</p> <p>American Institute of Architects, New York, N. Y. (In principle).</p> <p>American Specification Institute, Chicago, Ill.</p> <p>Asheville Merchants Association, Asheville, N. C.</p> <p>Burning Oil Distributors Association, Chicago, Ill. (In principle).</p> <p>Chicago Oil Burner Association, Chicago, Ill.</p> <p>Federation of Mutual Fire Insurance Co's., Chicago, Ill. (In principle).</p> <p>Fuel Oil Distributors Association of New Jersey, Newark, N. J.</p> <p>Heating, Piping, and Air Conditioning Contractors Cincinnati Association, Cincinnati, Ohio.</p> <p>Heating & Piping Contractors District of Columbia Association, Inc., Washington, D. C. (In principle).</p> <p>Heating, Piping & Air Conditioning Association, Norfolk, Va.</p> <p>Heating, Piping & Air Conditioning Contractors National Association, New York, N. Y.</p> <p>Household Science Institute, Chicago, Ill.</p> <p>Indianapolis, Building Owners & Managers Association of, Indianapolis, Ind.</p> <p>Institute of Boiler & Radiator Manufacturers, The, New York, N. Y.</p> <p>Massachusetts Oil Heating Association, Inc., Boston, Mass.</p> | <p>Merchants & Manufacturers Association, Oil Heating Division, Washington, D. C. (In principle).</p> <p>National Association of Purchasing Agents, New York, N. Y.</p> <p>National Council of Women of the U. S., New York, N. Y.</p> <p>National Warm Air Heating & Air Conditioning Association, Cleveland, Ohio.</p> <p>Ohio Petroleum Marketers Association, Inc., Columbus, Ohio.</p> <p>Oil Burner Industry, Standards Committee, New York, N. Y. (In principle).</p> <p>Oil Burner Institute, Inc., New York, N. Y. (In principle).</p> <p>Oil Heating Institute, New York, N. Y. (In principle).</p> <p>Oregon Oil Burner Association, Portland, Ore.</p> <p>Pacific Oil Burner Association, San Francisco, Calif.</p> <p>Producers' Council, Inc., The, New York, N. Y. (In principle).</p> <p>Richmond, Va., Inc., Master Plumbers & Heating Association of, Richmond, Va.</p> <p>Saginaw Association of Master Plumbers, Saginaw, Mich.</p> <p>St. Louis Association of Heating, Piping & Air Conditioning Contractors' St. Louis, Mo.</p> <p>Seattle Oil Fuel Dealer's Association, Seattle, Wash.</p> <p>Southern Hotel Association, Greensboro, N. C. (In principle).</p> <p>Steam Heating Equipment Manufacturers' Association, New York, N. Y. (In principle).</p> <p>Stove Mounters International Union of North America, St. Louis, Mo.</p> <p>Western Petroleum Refiners Association, Tulsa, Okla.</p> |
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FIRMS

- Aahnes Burner Co. (J. Arthur Harris & Son), Washington, D. C.
 Abbott Engineering Company, Newark, N. J.
 Ace Engineering Co., Chicago, Ill.
 Acme Oil Burner Co., Inc., Cedar Rapids, Iowa.
 Acme Tool & Gauge Co., Providence, R. I.
 Adams, Franklin O., Tampa, Fla.
 Agnew & Co., Inc., John P., Washington, D. C.
 Air Conditioning & Oil Heat Magazine, New York, N. Y. (In principle.)
 Aitcheson, Inc., Alexandria, Va.
 "Albertson" of Lewes, Del., Lewes, Del.
 Aldrich Co., Wyoming, Ill.
 Allied Oil & Burner Co., Inc., Cleveland, Ohio.
 Allfillisch, Charles, Decorah, Iowa.
 American Furnace Co., St. Louis, Mo.
 American Gas Machine Co., Albert Lea, Minn.
 American Houses, Inc., New York, N. Y.
 American Mohawk Co., New York, N. Y.
 American Oil Burner Co., Los Angeles, Calif.
 American Radiator & Standard Sanitary Corporation, Pittsburgh, Pa.
 Amsterdam, Chamber of Commerce of Amsterdam, N. Y.
 Anchor Post Fence Co., Heating Division, Baltimore, Md.
 Andrews, Jones, Biscoe & Whitmore, Boston, Mass.
 Arrow Petroleum Co., Forest Park, Ill.
 Asheim, Leonard, Bridgeport, Conn.
 Atwater Fuel Corporation, New York, N. Y.
 Auler, Jensen & Brown, Oshkosh, Wis.
 Austin, Ennis R., South Bend, Ind.
 Auto-Heat Corporation, New York, N. Y.
 Automatic Heat Inc., Philadelphia, Pa.
 Automatic Heating & Cooling Systems, Inc., Baltimore, Md.
 Balch & Lippert, Madison, Wis.
 Barker Engineering Co., Perry, Boston, Mass.
 Baumer, Herbert, Columbus, Ohio.
 Baylinson, S. Brian, New York, N. Y.
 Bennett Inc., Lawrence J., West Hempstead, N. Y.
 Bennett Oil Co., Omaha, Nebr.
 Bethlehem Foundry & Machine Co., Bethlehem, Pa.
 Beuttler & Arnold, Sioux City, Iowa.
 Bial, George F., Hasbrouck Heights, N. J.
 Blithe, Wesley Leshner, Philadelphia, Pa.
 Boehm, George A., New York, N. Y.
 Bogner, Harry, Milwaukee, Wis.
 Borg-Warner Corporation, Norge Heating & Conditioning Division, Detroit, Mich.
 Born Engineering Co., Tulsa, Okla.
 Braseth & Houkom, Fargo, N. Dak.
 Braun Bros. Heating Supply Co., Winnetka, Ill.
 Brazer, Clarence W., New York, N. Y.
 Brust & Brust, Milwaukee, Wis.
 Bucky, Fred W., Jr., Jacksonville, Fla.
 Buechner & Orth, St. Paul, Minn. (In principle).
 Bull, Ralph N., Sparta, N. J.
 Burkart-Schier Chemical Co., Chattanooga, Tenn.
 Burnham Boiler Corporation, Irvington, N. Y. (In principle).
 Burshaw Oil Corporation, Salem, Mass.
 Cagney Co., J. R., Chicago, Ill.
 Caleso Corporation, Lynn, Mass.
 Caloroil Burner Corporation, The, Hartford, Conn.
 Cannon & Mullen, Salt Lake, Utah.
 Carpenter, Charles A., Rochester, N. Y.
 Carragher Bros., Lowell, Mass.
 Carrier Corporation, Syracuse, N. Y.
 Carroll, John, Ventnor, N. J.
 Catawba Oil Co., Lancaster, S. C.
 Cellarius, Charles Frederick, Cincinnati, Ohio.
 Central Co-operative Wholesale, Superior, Wis.
 Centralia Stoker Co., Centralia, Wash.
 Century Engineering Corporation, Cedar Rapids, Iowa.
 Chalmers Oil Burner Co., Minneapolis, Minn.
 Chandler Co., Cedar Rapids, Iowa.
 Chicago, Burlington & Quincy Railroad, Chicago, Ill.
 Child, Harry Charles, Sayre, Pa.
 Children's Country Home, Westfield, N. J.
 Childs & Smith, Chicago, Ill.
 Chrysler Corporation, Airtemp Division, Dayton, Ohio.
 Cincinnati, City of, Department of Purchasing, Cincinnati, Ohio.
 Citro Oil Burners Corporation, Haskell, N. J.
 Clark, Carl W., Cortland, N. Y.
 Cleveland, City of, Sub-Division of Smoke Abatement, Cleveland, Ohio.
 Cleveland Steel Products Corporation, Cleveland, Ohio.
 Coit, E., New York, N. Y.
 Colonial Beacon Oil Co., Boston, Mass.
 Columbia Radiator Co., McKeesport, Pa.
 Conco Corporation, Mendota, Ill.
 Conco Engineering Works, Mendota, Ill.
 Concord Burner Co., Inc., Brooklyn, N. Y.
 Conrad & Cummings, Binghamton, N. Y.
 Consumers Cooperatives Associated, Amarillo, Tex.
 Consumers Petroleum Co., Chicago, Ill.
 Cooper, David M., Ambridge, Pa.
 Corlett, Will. G., Oakland, Calif.

- Cornell Sales Co., New York, N. Y.
 Cornell University, Ithaca, N. Y. (In principle).
 County Seat Plumbing Supply Co., Inc., White Plains, N. Y.
 Cram & Ferguson, Boston, Mass.
 Crane Co., Chicago, Ill.
 Cross Coal Co., Lawrence, Mass.
 Crowell & Lancaster, Bangor, Maine.
 Crump Co., Inc., Benj. T., Richmond, Va.
 Curtsinger, L. P., Eugene, Oreg.
 De Jarnette, Charles Wagner, Des Moines, Iowa.
 Delehanty, Andrew L., Albany, N. Y.
 D'Elia Oil Burner Co., Bridgeport, Conn.
 Delta Star Electric Co., Chicago, Ill.
 Detroit Lubricator Co., Detroit, Mich.
 Dodge Corporation, F. W. (Sweet's Catalog Service), Chicago, Ill.
 Dodge & Morrison, New York, N. Y.
 Dome Oil Co., Inc., Washington, D. C.
 Dubin & Co., Inc., Hartford, Conn.
 East Orange N. J. Fire Department, East Orange, N. J. (In principle).
 Eastern Oil & Equipment Co., Portland, Maine.
 Edwards, Inc., John, Brooklyn, N. Y.
 Eldridge, Charles William, Oswego, N. Y.
 Electrical Testing Laboratories, New York, N. Y.
 Electrol, Inc., Clifton, N. J.
 Elliott-Lewis Co., Philadelphia, Pa.
 Emery Industries, Inc., Cincinnati, Ohio.
 Engineering Systems, Inc., Chicago, Ill.
 Erdelen, Arthur F., St. Louis, Mo. (In principle).
 Evans, M. B., Lancaster, Pa.
 Factory Mutual Laboratories, Boston, Mass.
 Fadoo Heating Co., Jamaica, Long Island, N. Y.
 Farmers Union Central Exchange, Inc., So. St. Paul, Minn.
 Farr, Albert, & J. Francis Ward, San Francisco, Calif.
 Faultless Oil Burner Co., St. Albans, Long Island, N. Y.
 Fisher Electrical Service, Union, N. J.
 Flanders, Louis E., Haverhill, Mass.
 Flannagan, Eric G., Henderson, N. C.
 Fleet Oil Co., Inc., East Rockaway, N. Y.
 Florida, State of, Department of Architecture, Board of Control, Gainesville, Fla.
 Foltz & Son, Herbert, Indianapolis, Ind.
 Frost Coal & Oil Co., Dorchester, Mass.
 Fuller Engineering Co., E. F., Nashotah, Wis.
 Gaertner, Otto, Yonkers, N. Y.
 Garwood Industries, Inc., Detroit, Mich.
 Gasoroil Manufacturing Corporation, Genoa City, Wis.
 Gasoroyle Burner Co., Minneapolis, Minn.
 General Electric Co., Bloomfield, N. J.
 Georgeson, F. T., Eureka, Calif.
 Gilbert & Barker Manufacturing Co., West Springfield, Mass.
 Goodrich Oil Burner Manufacturing Corporation, New Haven, Conn.
 Grange Cooperative Wholesale, Seattle, Wash.
 Green Colonial Furnace Co., Des Moines, Iowa.
 Greenwood Engineering Co., Inc., Baltimore, Md.
 Grover, James B., Rockaway Beach, N. Y. (In principle).
 Haggart's Service, Inc., Fargo, N. Dak.
 Hahn, Stanley W., Silver Spring, Md.
 Hall Bros. Oil Co., Dayton, Ohio.
 Harley & Ellington, Detroit, Mich.
 Harris, Jay, Bronx, N. Y.
 Harrison & Rouse Fuel Co., Baltimore, Md.
 Hart & Crouse Corporation, Utica, N. Y.
 Hart Oil Burner Corporation, Peoria, Ill.
 Hartley & Son Heating & Plumbing, Elwood, Ind.
 Harvard University, Cambridge, Mass.
 Harvey-Whipple, Inc., Springfield, Mass.
 Hasness, Carlisle D., Harrisburg, Pa.
 Hausman, N. W., Glen Cove, N. Y.
 Hayward Manufacturing Co., Inc., Brooklyn, N. Y.
 Heacock & Platt, Philadelphia, Pa.
 Heating Distributors Co., Winona, Minn.
 Heating Service Co., Winnetka, Ill.
 Heating Supply Co., Inc., Rochester, N. Y.
 Heil Co., The, Milwaukee, Wis.
 Helfensteller, Hirsch & Watson, St. Louis, Mo.
 Hentz, Adler & Shutze, Atlanta, Ga.
 Herbst E. Kuenzli, Milwaukee, Wis.
 Herco Oil Burner Corporation, Lancaster, Pa.
 Herlan-Patterson, Inc., Buffalo, N. Y.
 Hoben Manufacturing Co., Waltham, Mass.
 Hoffman Specialty Co., Inc., New York, N. Y.
 Hoit, Price & Barnes, Kansas City, Mo.
 Holland Furnace Co., Holland, Mich.
 Home Heating Co., Hinsdale, Ill.
 Home & Industrial Service, Schenectady, N. Y.
 Hopkins, Albert Hart, Buffalo, N. Y.
 Hospital Bureau of Standards & Supplies, Inc., New York, N. Y.
 Hotel Bannock Co., Pocatello, Idaho.

- Housing Co. of Dundalk, Inc., The, Dundalk, Md.
 Hubbard Oil Burner Co., Inc., Minneapolis, Minn.
 Hueller Manufacturing Co., Inc., H. J., Brooklyn, N. Y.
 Industrial Heating & Engineering Co., Milwaukee, Wis.
 International Boiler Works Co., The, East Stroudsburg, Pa.
 International Heater Co., Utica, N. Y.
 Jacobs, Lionel L., Wayne, Pa. (In principle).
 Jamme, Bernard E., Summit, N. J.
 Jenkins Engineering Co., Seattle, Wash.
 Johns Hopkins Hospital, The, Baltimore, Md.
 Johnson Co., S. T., Oakland, Calif.
 Johnson Oil Burner Sales Co., Chicago, Ill.
 Johnson, Wallwork & Dukehart, Portland, Ore.
 Kahn, Albert, Associated Architects & Engineers, Inc., Detroit, Mich.
 Kahn, Ely Jacques—Robert Allan Jacobs, New York, N. Y.
 Kalamazoo Stove & Furnace Co., Kalamazoo, Mich.
 Keich & O'Brien, Warren, Ohio.
 Kohler Co., Kohler, Wis.
 Kohn, Robert D.—Chas. Butler, New York, N. Y.
 Korth Oil Burner Corporation, Roselle Park, N. J.
 Kres-Kno Oil Burner Manufacturing Co., New York, N. Y.
 Kresky Manufacturing Co., Inc., Petaluma, Calif.
 Kruckemeyer & Strong, Cincinnati, Ohio.
 Lake Shore Club of Chicago, Chicago, Ill.
 Lammert & Mann Co., Chicago, Ill.
 Landwehr Heating Corporation, Philadelphia, Pa.
 Larrick, Thomas, Athens, Ohio.
 Lattner Mfg. Co., P. M., Cedar Rapids, Iowa.
 Law, Law & Potter, Madison, Wis.
 Lawrence & Allyn, Portland, Ore.
 Lee, W. H., Philadelphia, Pa.
 Lennox Furnace Co., Marshalltown, Iowa.
 Levy, Will, St. Louis, Mo.
 Lewiston Hardware & Plumbing Supply Co., Lewiston, Maine.
 Liggett Drug Co., Inc., New York, N. Y.
 Loeb, Laurence M., White Plains, N. Y.
 Luxor Oil Burner Service, West Englewood, N. J.
 Lynch & Foard, Wilmington, N. C.
 Lynn Products Co., Inc., Lynn, Mass.
 Mack Air Conditioning Corporation, Atlantic City, N. J.
 Madeley, John P., Millville, N. J.
 Madison, City of, Madison, Wis.
 Major Oil Burner Co., Philadelphia, Pa.
 Malleable Iron Fittings Co., Branford, Conn.
 Mann & Co., Hutchinson, Kans.
 Manufacturers Selling Co., Trenton, N. J.
 Marsh Tritol Co., Chicago, Ill. (In principle).
 Martin, Edgar, Chicago, Ill.
 Martin Brothers, Toronto, Ontario, Canada.
 Martin & Son, A. Oscar, Doylestown, Pa.
 Martino, A. R., Waterbury, Conn.
 Mason & Co., George D., Detroit, Mich.
 Mason & Co., Inc., W. C., Hartford, Conn.
 Massachusetts, Metropolitan District Commission of, Boston, Mass.
 Massachusetts Wharf Coal Co., Cambridge, Mass.
 Massena & duPont, Inc., Wilmington, Del.
 Massey, Wood & West, Inc., Richmond, Va.
 Masten & Hurd, San Francisco, Calif.
 Mauran, Russell, Crowell & Mullgardt, St. Louis, Mo.
 May Oil Burner Corporation, Baltimore, Md.
 McEnaney Oil Corporation, Albany, N. Y.
 McIlvaine Burner Corporation, Chicago, Ill.
 McMahill Heating Service, Omaha, Nebr.
 Mercoid Corporation, The, Chicago, Ill.
 Messer Co., Inc., The, Newark, N. J.
 Metropolitan Petroleum Co., Inc., Bethesda, Md.
 Miami University, Oxford, Ohio.
 Michigan Tank & Furnace Corporation, Detroit, Mich.
 Micro Switch Corporation, Freeport, Ill.
 Mid-Hudson Oil Co., Inc., Poughkeepsie, N. Y.
 Miller Co., The, Meriden, Conn.
 Miller & Yeager, Terre Haute, Ind.
 Minneapolis, City of, Department of Buildings, Minneapolis, Minn.
 Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.
 Montag Stove & Furnace Works, Portland, Ore.
 Montgomery Ward & Co., Chicago, Ill.
 Moore, David H., Atlantic City, N. J.
 Mooser, William, San Francisco, Calif.
 Mormile Wholesale Plumbing & Heating Supply, Amsterdam, N. Y.
 Mueller, F. G. & W. R. Hair, Hamilton, Ohio.
 Muhlenberg Bros., Reading, Pa.
 National Airoil Burner Co., Philadelphia, Pa.
 National Radiator Co., The, Johnstown, Pa.

- New Orleans, Better Business Bureau of, New Orleans, La. (In principle).
- New York City, Department of Purchase, New York, N. Y.
- New York, State of, Office of Commissioner of Architecture, Albany, N. Y.
- New York State Reconstruction Home, West Haverstraw, N. Y.
- New York Testing Laboratories, New York, N. Y.
- Noland Co., Inc., Newport News, Va.
- North Carolina, State of, Division of Purchase & Contract, Raleigh, N. C.
- Northern Controlled Heat Co., Inc., Watertown, N. Y.
- Nu-Way Corporation, The, Rock Island, Ill.
- Officer, Gwynn, Berkeley, Calif.
- Oil Burning Engineers, Inc., Chicago, Ill.
- Oil Burning Engineers, Inc., Evanston, Ill.
- Oil Equipment Laboratories, Inc., Elizabeth, N. J.
- Oil Heating & Service, Inc., Baltimore, Md.
- Oil-Elec-Tric Co., Minneapolis, Minn.
- Old Colony Machine Works Co., Fall River, Mass.
- Orange Memorial Hospital, Orange, N. J. (In principle).
- Pacific Supply Cooperative, Walla Walla, Wash.
- Pancoast, Russell T., Miami Beach, Fla.
- Paragon Oil Burner Corporation, Brooklyn, N. Y. (In principle).
- Patchogue Oil Term. Corporation, Brooklyn, N. Y.
- Peaster Oil Co., Winnetka, Ill.
- Penn Electric Switch Co., Goshen, Ind.
- Pennsylvania, Commonwealth of, Harrisburg, Pa.
- Pennsylvania Petroleum Products Co., Providence, R. I.
- Pennsylvania State College, The, State College, Pa.
- Pepper, Jr., Geo. W., Philadelphia, Pa.
- Perfect Air Conditioning Co., Washington, D. C.
- Perfection Stove Co., Cleveland, Ohio.
- Perfex Corporation, Milwaukee, Wis.
- Perfex Corporation, Boston, Mass. (In principle).
- Petroleum Heat & Power Co., Stamford, Conn.
- Petroleum Service Co., Inc., Providence, R. I.
- Petro-Nokol Oil Heating Co., Washington, D. C.
- Pierre & Wright, Indianapolis, Ind.
- Pines-Hatkin Co., Dallas, Tex.
- Plymouth Machine & Burner Corporation, Plymouth, Mass.
- Plymouth Systems, Inc., Philadelphia, Pa.
- Poad Sheet Metal & Furnace Co., Cleveland, Ohio.
- Pomeroy Organization, Inc., Rochester, N. Y.
- Preferred Utilities Co., Inc., New York, N. Y.
- Pressure Oil Burners, Inc., York, Pa.
- Proudfoot Rawson—Brooks & Borg, Des Moines, Iowa.
- Provine, L. H., Urbana, Champaign, Ill. (In principle).
- Prox Co., Inc., Frank, Terre Haute, Ind.
- Quaker Manufacturing Co., Chicago, Ill.
- Queens Heating & Plumbing Corporation, St. Albans, L. I., N. Y.
- Quiet Heat Manufacturing Corporation, Newark, N. J.
- Quiet Heat Oil Burner Co., Inc., Brooklyn, N. Y.
- Quincy Oil Co., The, Quincy, Mass.
- Radiant Utilities Corporation, Brooklyn, N. Y.
- Ray Oil Burner Co., San Francisco, Calif.
- Rearick Bros. Automatic Heating, Gary, Ind.
- Reid, William H., Jr., Billings, Mont.
- Reif-Rexoil, Inc., Buffalo, N. Y.
- Ritchie & Associates, James H., Boston, Mass.
- Robert & Co., Inc., Atlanta, Ga.
- Rochester, City of, Board of Education, Rochester, N. Y.
- Rochester, City of, Fire Prevention Division, Rochester, N. Y.
- Rockwell Co., W. S., New York, N. Y.
- Rolnick Testing & Manufacturing Co., Philadelphia, Pa.
- S-K Co., Inc., Camden, N. J.
- Sacramento, Better Business Bureau of, Sacramento, Calif. (In principle).
- St. John's Hospital, Brooklyn, N. Y.
- St. Luke's Hospital, Bethlehem, Pa.
- Schoeppe, Edward, Philadelphia, Pa.
- Schulzke, William H., Moline, Ill.
- Schuylkill Valley Oil Co., Pottstown, Pa.
- Scott-Newcomb, Inc., St. Louis, Mo.
- Sears, Roebuck & Co., Chicago, Ill.
- Security Oil Co., Baltimore, Md.
- Shawmut Oil Burner Co., Waltham, Mass.
- Shell Oil Co., Inc., New York, N. Y.
- Shutts & Morrison, Erie, Pa. (In principle).
- Silent-Flame Oil Burner Co., Bronx, N. Y.
- Silent Glow Oil Burner Corporation, Hartford, Conn.
- Simplex Oil Heating Corporation, New York, N. Y.
- Smith Co., Inc., The H. B., Westfield, Mass.
- Southwestern Bell Telephone Co., St. Louis, Mo.
- Spencer, Eldridge T., San Francisco, Calif.

- Standard Oil Co. of California, San Francisco, Calif.
 Standard Oil Co. of New Jersey, New York, N. Y., and Washington, D. C.
 Standard Oil Co. of Pennsylvania, Philadelphia, Pa.
 Standard Utilities Corporation, Newark, N. J.
 Staub & Rather, Houston, Tex.
 Stuart & Bro., Inc., L. P., Washington, D. C.
 Stopper, Eugene A., Philadelphia, Pa.
 Studerus Oil Co., Inc., Kearny, N. J.
 Sundstrand Engineering Co., Rockford, Ill.
 Sundstrand Machine Tool Co., Pump Division, Rockford, Ill.
 Sunland Refining Corporation, Fresno, Calif.
 Super Electric Products Corporation, Jersey City, N. J.
 Swarthmore Heating Service, Swarthmore, Pa.
 Swirling Heat, Inc., Arlington, Va.
 Sylvestre Oil Co., Inc., Mount Vernon, N. Y.
 Taylor, Ellery K., Haddonfield, N. J.
 Taylor, Edward Cray, & Ellis Wing Taylor, Los Angeles, Calif.
 Texas Tech. College, Dept. Architecture & Allied Arts, Lubbock, Tex. (In principle).
 Thatcher Furnace Co., Newark, N. J.
 Thorne, Henry Calder, Ithaca, N. Y.
 Timken Detroit Axle Co., Timken Silent Automatic Div., Detroit, Mich.
 Town & Country Oil Burner Co., Inc., Mt. Vernon, N. Y.
 Troast & Associates, N. Lester, Anchorage, Alaska.
 Tru-Heat Co., Trenton, N. J.
 Underwriters' Laboratories, Inc., Chicago, Ill. (In principle).
 United Equipment & Supply Co., Washington, D. C.
 United States Metals Refining Co., Carteret, N. J.
 United States Radiator Corporation, Detroit, Mich.
 Universal Engineering Co., Midland Park, N. J.
 Utica Radiator Corporation, Utica, N. Y.
 Viking Manufacturing Corporation, Detroit, Mich.
 Virginia Polytechnic Institute, Blacksburg, Va.
 Voell, Richard F., Alexandria, Va.
 Vogel, Willis A., Toledo, Ohio.
 Volcano Burner Corporation, New York N. Y.
 Wachter & Wachter, Toledo, Ohio.
 Walsh, Louis A., Waterbury, Conn.
 Waltham, City of, Waltham, Mass.
 Wampler Co., H. F., Philadelphia, Pa.
 Ward, Inc., Thomas E., Hanover, N. H.
 Ware & McClenahan, Salt Lake City, Utah.
 Waterman-Waterbury Co., The, Minneapolis, Minn.
 Wayne Oil Burner Corporation, Ft. Wayne, Ind.
 Weatherall Engineers, Inc., Providence, R. I.
 Webster Electric Co., Racine, Wis. (In principle).
 Webster Oil Burner Co., Bronx, N. Y.
 Welch, Carroll E., Huntington, N. Y.
 Westchester Home Equipment Co., Inc., New York, N. Y.
 White Fuel Corporation, South Boston, Mass.
 White-Rodgers Electric Co., St. Louis Mo.
 Whiteway Manufacturing Co., Inc., South Boston, Mass.
 Wight & Wight, Kansas City, Mo.
 Willatsen, Andrew, Seattle, Wash.
 Williams Oil-O-Matic Heating Corporation, Bloomington, Ill.
 Winter Co., G. C., Southbridge, Mass.
 Wischmeyer, William F., St. Louis, Mo.
 Wisconsin Oil Burner Co., Madison, Wis.
 Wood & Son Associates, E. J., Clarksburg, W. Va.
 Wright, Frank H., Detroit, Mich. (In principle).
 York Ice Machinery Corporation, York, Pa.
 York Oil Burner Co., Inc., York, Pa.

U. S. GOVERNMENT

- Agriculture, Department of, Washington, D. C.
 Federal Housing Administration, Washington, D. C.
 United States Housing Authority, Washington, D. C.
 State, Department of, Washington, D. C.
 Treasury Department, Washington, D. C.
 Veterans' Administration, Washington, D. C.
 War Department, Washington, D. C.

COMMERCIAL STANDARDS

CS No.	Item	CS No.	Item
0-40.	Commercial standards and their value to business (third edition).	54-35.	Mattresses for hospitals.
1-42.	Clinical thermometers (third edition).	55-35.	Mattresses for institutions.
2-30.	Mopsticks.	56-41.	Oak flooring (second edition).
3-40.	Stoddard solvent (third edition).	57-40.	Book cloths, buckrams, and impregnated fabrics for bookbinding purposes except library bindings (second edition).
4-29.	Staple porcelain (all-clay) plumbing fixtures.	58-36.	Woven elastic fabrics for use in overalls (overall elastic webbing).
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6-31.	Wrought-iron pipe nipples (second edition). Superseded by CS5-40.	60-36.	Hardwood dimension lumber.
7-29.	Standard weight malleable iron or steel screwed unions.	61-37.	Wood-slat venetian blinds.
8-41.	Gage blanks (third edition).	62-38.	Colors for kitchen accessories.
9-33.	Builders' template hardware (second edition).	63-38.	Colors for bathroom accessories.
10-29.	Brass pipe nipples. Superseded by CS5-40.	64-37.	Walnut veneers.
11-41.	Moisture regains of cotton yarns (second edition).	65-38.	Wool and part-wool fabrics.
12-40.	Fuel oils (fifth edition).	66-38.	Marking of articles made wholly or in part of platinum.
13-39.	Dress patterns (second edition).	67-38.	Marking articles made of karat gold.
14-39.	Boys' button-on waists, shirts, junior and polo shirts (made from woven fabrics) (second edition).	68-38.	Liquid hypochlorite disinfectant, deodorant, and germicide.
15-29.	Men's pajamas.	69-38.	Pine oil disinfectant.
16-29.	Wallpaper.	70-41.	Phenolic disinfectant (emulsifying type) (second edition) (published with CS71-41).
17-42.	Diamond core drill fittings (third edition).	71-41.	Phenolic disinfectant (soluble type) (second edition) (published with CS70-41).
18-29.	Hickory golf shafts.	72-38.	Household insecticide (liquid spray type).
19-32.	Foundry patterns of wood (second edition).	73-38.	Old growth Douglas fir standard stock doors.
20-36.	Staple vitreous china plumbing fixtures (second edition).	74-39.	Solid hardwood wall paneling.
21-39.	Interchangeable ground-glass joints, stopcocks, and stoppers (fourth edition).	75-42.	Automatic mechanical draft oil burners designed for domestic installations (second edition).
22-40.	Builders' hardware (nontemplate) (second edition).	76-39.	Hardwood interior trim and molding.
23-30.	Feldspar.	77-40.	Sanitary cast-iron enameled ware.
24-30.	Standard screw threads.	78-40.	Ground-and-polished lenses for sun glasses (second edition) (published with CS79-40).
25-30.	Special screw threads.	79-40.	Blown, drawn, and dropped lenses for sun glasses (second edition) (published with CS78-40).
26-30.	Aromatic red cedar closet lining.	80-41.	Electric direction signal systems other than semaphore type for commercial and other vehicles subject to special motor vehicle laws (after market).
27-36.	Mirrors (second edition).	81-41.	Adverse-weather lamps for vehicles (after market).
28-32.	Cotton fabric tents, tarpaulins, and covers.	82-41.	Inner-controlled spotlamps for vehicles (after market).
29-31.	Staple seats for water-closet bowls.	83-41.	Clearance, marker, and identification lamps for vehicles (after market).
30-31.	Colors for sanitary ware.	84-41.	Electric tail lamps for vehicles (after market).
31-38.	Wood shingles (fourth edition).	85-41.	Electric license-plate lamps for vehicles (after market).
32-31.	Cotton cloth for rubber and pyroxylin coating.	86-41.	Electric stop lamps for vehicles (after market).
33-32.	Knit underwear (exclusive of rayon).	87-41.	Red electric warning lanterns.
34-31.	Bag, case, and strap leather.	88-41.	Liquid burning flares.
35-31.	Plywood (hardwood and eastern red cedar).	89-40.	Hardwood stair treads and risers.
36-33.	Fourdrinier wire cloth (second edition).	90- .	(reserved for power shovels and cranes.)
37-31.	Steel bone plates and screws.	91-41.	Factory fitted Douglas fir entrance doors.
38-32.	Hospital rubber sheeting.	92-41.	Cedar, cypress and redwood tank stock lumber.
39-37.	Wool and part wool blankets (second edition) (Withdrawn as commercial standard, July 14, 1941).	93-41.	Portable electric drills (exclusive of high frequency).
40-32.	Surgeons' rubber gloves.	94-41.	Calking lead.
41-32.	Surgeons' latex gloves.	95-41.	Lead pipe.
42-35.	Fiber insulating board (second edition).	96-41.	Lead traps and bends.
43-32.	Grading of sulphonated oils.	97-42.	Electric supplementary driving and passing lamps for vehicles (after market).
44-32.	Apple wraps.	98-42.	Artists' oil paints.
45-40.	Douglas fir plywood (domestic grades) (fourth edition).	99-42.	Gas floor furnaces—gravity circulating type.
46-40.	Hosiery lengths and sizes (third edition).	100-42.	Multiple-coated, porcelain-enameled steel utensils.
47-34.	Marking of gold-filled and rolled-gold-plate articles other than watch cases.	101-43.	Flue-connected oil-burning space heaters equipped with vaporizing pot-type burners.
48-40.	Domestic burners for Pennsylvania anthracite (underfeed type) (second edition).		
49-34.	Chip board, laminated chip board, and miscellaneous boards for bookbinding purposes.		
50-34.	Binders board for bookbinding and other purposes.		
51-35.	Marking articles made of silver in combination with gold.		
52-35.	Mohair pile fabrics (100-percent mohair plain velvet, 100-percent mohair plain frieze, and 50-percent mohair plain frieze).		
53-35.	Colors and finishes for cast stone.		

NOTICE.—Those interested in commercial standards with a view toward accepting them as a basis of everyday practice may secure copies of the above standards, while the supply lasts, by addressing the Division of Trade Standards, National Bureau of Standards, Washington, D. C.

